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TRIANNUAL REPORT

on the

DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS

For Period Ending

31 March 1982

Contract 955567

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The JPL Flat-Plate Solar Array Project is sponsored by the U.S. Department of Energy and forms part of the Solar Photovoltaic Conversion Program to initiate a major effort toward the development of low-cost solar arrays. This work was performed for the Jet Propulsion Laboratory, California Institute of Technology by agreement between NASA and DOE.



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Section 1.0

SUMMARY

Construction details for the qualification modules have been finalized. An aliphatic polyurethane casting system will be used on two of the modules.

The "Phase II Program Results Periodic Report Supplement" has been completed and is enclosed with this report.

Section 2.0

INTRODUCTION

The objective of this program is to develop analytical methodology for advanced encapsulation designs. From these methods design sensitivities will be established for the development of photovoltaic module criteria and the definition of needed research tasks.

The program consists of three phases. In Phase I, analytical models were developed to perform optical, thermal, electrical and structural analyses on candidate encapsulation systems. From these analyses several candidate systems will be selected for qualification testing during Phase II. Additionally, during Phase II, test specimens of various types will be constructed and tested to determine the validity of the analysis methodology developed in Phase I. In Phase III, a finalized optimum design based on knowledge gained in Phases I and II will be developed and delivered to JPL.

Section 3.0

TECHNICAL DISCUSSION

3.1 QUALIFICATION MODULE CONSTRUCTION

JPL and Spectrolab personnel visited Advanced Development Associates in North Kingston, Rhode Island, to assess the aliphatic polyester urethane for use as a pottant. A test panel 4' x 4' was made using Z2591 urethane with an acrylar film top cover on a wood substrate. The system was determined to be feasible.

The two component metering and mixing dispenser diagramed in Figure 1 was purchased from Advanced Development Associates. This will enable the airless mixing and applying of the polyurethane pottant.

The ten qualification modules will be built using 4' x 4' ribbed wood substrate design. The three different designs will be built as follows:

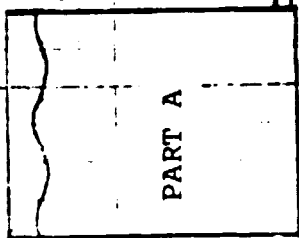
Type 1 - Acrylar front cover with aliphatic polyether urethane pottant.

Type 2 - Acrylar/EVA/Acrylar lamination bond to the wood substrate with polyether urethane adhesive.

Type 3 - Tedlar/EVA/Tedlar lamination bonded to the wood substrate with polyether urethane adhesive.

TWO COMPONENT METERING AND MIXING DISPENSER (SCHEMATIC, NOT TO SCALE)

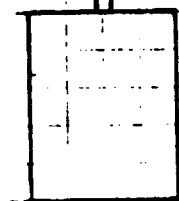
MATERIAL TANK



PART A

VALVE

VARIABLE SPEED MOTOR



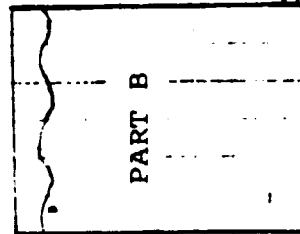
ZENITH PUMPS

TWO-WAY VALVES
POUR OR FLUSH

STATIC MIXING
TUBE

2

MATERIAL TANK



PART B

VALVE

TWO-WAY
VALVE
AIR OR
SOLVENT

POINT
POT

TO AIR COMPRESSOR
REGULATOR

SOLVENT

ORIGINAL PAGE IS
OF POOR QUALITY

Figure 1

Two-type 1, four-type 2, and four-type 3 modules will be constructed each with 121, 4" x 4" cells previously manufactured. The laminated designs will be constructed at JPL with Spectrolab personnel using JPL 4' x 4' vacuum laminator currently under construction.

Type 10CP3110 Scotchpar and type X4701 Acrylar have been received from 3M. Type 4910 contact adhesive from 3M will be used to bond the Scotchpar to the wood substrate. 48" wide Tedlar in both white and clear is being shipped by Dupont. The exact type of Tedlar is being selected by Joe Wilson at Dupont.

121 strings of 11 cells each have been fabricated. These strings use 4" x 4" cells previously made by Spectrolab.

3.2 PHASE II REPORT

The results of Phase II testing has been documented in a report titled "Phase II Program Results Periodic Report Supplement." The Phase II report is enclosed.

Section 4.0

CONCLUSIONS AND RECOMMENDATIONS

There are no conclusions and recommendations for this period.

Section 5.0

PLANNED ACTIVITIES

During the next period construction of the qualification modules will begin. Additional optical computer runs have also been scheduled.